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September 13, 2004

Anita J. Falo 9/13/2004

SIGNATURE DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Roger A. McCurdy
Serial No.	:	09/494,954
Filing Date	:	February 1, 2000
For	:	METHOD AND APPARATUS FOR CONTROLLING AN ACTUATABLE OCCUPANT PROTECTION DEVICE USING AN ULTRASONIC SENSOR
Group Art Unit	:	3611
Examiner	:	Lee S. Lum
Attorney Docket No.	:	TRW(TE)4170

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Following the Notice of Appeal filed May 11, 2004, Appellant presents this Appeal Brief, filed in triplicate.

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1. REAL PARTY IN INTEREST

The real party in interest is TRW Automotive U.S. LLC. An assignment of this application to TRW, Inc. was recorded February 1, 2000, Reel/Frame: 010548/0647. This application has been subsequently assigned to TRW Automotive U.S. LLC via an unrecorded assignment.

2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

3. STATUS OF CLAIMS

Claims 1-22 were originally filed.

Claims 1-22 were rejected in an Office Action dated January 11, 2001.

In response to the Office Action of January 11, 2001, an Amendment was filed on April 23, 2001 in which claims 1, 4-8, 10, 14-18, and 20-22 were amended.

Claims 1-22 were finally rejected in an Office Action dated July 9, 2001.

A Response After Final was filed on November 8, 2001 in which it was argued that the rejection of claims 1-22 was improper.

An Advisory Action was issued on November 19, 2001 maintaining the rejection of claims 1-22.

In an Office Action dated December 12, 2001, the final rejection of claims 1-22 was withdrawn and claims 1-22 were rejected under new grounds.

A Response was filed on March 12, 2002 arguing that the rejection of claims 1-22 was improper.

In an Office Action dated May 17, 2002, the previous rejection of claims 1-22 was withdrawn and claims 1-22 were rejected under new grounds.

In a Response filed on August 16, 2002, it was argued that the rejection of claims 1-4, 10, 14, 17, and 22 as anticipated by Ross, U.S. Patent No. 5,884,203 (hereinafter "Ross"), was improper and a statement of common ownership was made with regard to Ross for overcoming an obviousness rejection of claims 5-9, 11-13, 15, 16, and 18-21.

In an Office Action dated November 15, 2002, claims 1-22 were finally rejected. The final rejected maintained the obviousness rejection using Ross as one of two references.

A Response After Final filed on November 19, 2002 argued that the rejection of claims 5-9, 11-13, 15, 16, and 18-21 was improper and that the finality of the Office Action was premature.

In an Office Action dated December 23, 2002, claims 1-4, 10, 14, 17, and 22 were finally rejected and claims 5-9, 11-13, 15, 16, and 18-21 were indicating as being allowable if rewritten in independent form.

A Request for Reconsideration After Final was filed on March 18, 2003 arguing that the rejection of claims 1-4, 10, 14, 17, and 22 was improper.

In an Office Action dated June 9, 2003, the rejection of claims 1-4, 10, 14, 17, and 22 as anticipated by Ross was maintained and claims 1-22 were rejected as obvious over Thompson et al., U.S. Patent No. 6,020,812 (hereinafter "Thompson et al."), in view of Feldmaier, U.S. Patent No. 4,842,301 (hereinafter "Feldmaier").

In a Response filed October 2, 2003, it was argued that the rejections set forth in the Office Action of June 9, 2003 were improper.

In an Office Action dated December 11, 2003, claims 1-5, 7-19, 21, and 22 were rejected as obvious over Thompson et al. in view of Feldmaier. Claims 6 and 20 were rejected as being obvious over Thompson et al. in view of Feldmaier and further in view of Breed et al., U.S. Patent No. 5,441,301 (hereinafter "Breed et al."). In the Remarks portion of the Office Action, the Examiner states that she "reiterates her rejections using Ross under 35 USC102(e)." The Office Action, however, never sets forth a rejection of claims using Ross. Therefore, it is assumed that the rejection of claims as anticipated by Ross has been withdrawn by the Office Action of December 11, 2003.

A Notice of Appeal was filed on May 11, 2004 in response to the Office Action of December 11, 2003.

In sum, independent claims 1, 10, 14, 17, and 22 and dependent claims 2-9, 11-13, 15, 16, and 18-21 are rejected and the rejection is appealed.

4. STATUS OF AMENDMENTS

No amendment was filed after the Office Action of December 11, 2003.

5. SUMMARY OF THE INVENTION

The present invention relates to a system 10 for helping to protect a vehicle occupant. The system comprises a crash sensor 32 that is operative to sense a vehicle crash event and to provide a crash signal having a characteristic indicative of the sensed crash event. The system 10 also comprises an acoustic safing sensor 34 that is operative to sense acoustic waves propagating through the vehicle structure during a vehicle crash event and to provide a safing signal having a characteristic indicative of the sensed crash event. An actuatable occupant

protection device of the system 10, when actuated, helps to protect the vehicle occupant during a vehicle crash event. The system 10 further includes a controller 30 that controls actuation of the occupant protection device in response to both the crash signal and the safing signal separately indicating the occurrence of a deployment crash event.

The actuatable occupant protection device of the system 10 may include, by way of example, a frontal inflatable restraint device 18, a side inflatable restraint device 20, or a seat belt pretensioner device 22 that is associated with the driver seat 14 of a vehicle 12. Alternatively, the actuatable occupant protection device may include a frontal inflatable restraint device 24, a side inflatable restraint device 26, or a seat belt pretensioner device 28 that is associated with the passenger seat 16 of the vehicle 12.

Each of the actuatable restraint devices 18, 20, 22, 24, 26, and 28 is electrically coupled to the controller 30. The controller 30 controls the actuation of the actuatable restraint devices 18, 20, 22, 24, 26, and 28 upon determining the occurrence of a vehicle crash event. The controller 30 is responsive to input signals from a plurality of crash event sensors 32, 34, 36, 38, and 40 for determining the occurrence of a crash event. Each of the plurality of crash event sensors 32, 34, 36, 38, and 40 is electrically coupled to the controller 30 and provides an input signal to the controller.

Crash sensor 32 comprises one or more accelerometers for sensing acceleration of the vehicle 12 and for providing a signal indicative of the sensed acceleration to the controller 30. Crash sensor 34 is an acoustic transducer, such as

an acoustic sensor, that is mounted to the vehicle. Crash sensor 34 senses high frequency acoustic waves that propagate through the vehicle structure during the occurrence of a vehicle crash event and provides signals indicative of the sensed acoustic waves to the controller 30.

Crash sensors 36, 38, and 40 are crush zone sensors. A crush zone sensor is a sensor that is located in a crush zone of the vehicle 12, i.e., a zone of the vehicle that is designed to crush during the occurrence of a vehicle crash event. In the embodiment of Fig. 1, crash sensor 36 is located at a radiator location of the vehicle 12 and crash sensors 38 and 40 are located along the doors or B-pillars of the vehicle. Crash sensors 36, 38, and 40 may be accelerometers that sense crash acceleration and provide signals to the controller 30 that are indicative of the sensed crash acceleration. Alternatively, the crash sensors 36, 38, and 40 may be deformation sensors that provide signals to the controller 30 indicating that an associated part of the vehicle 12 has been deformed by at least a predetermined amount.

The system 10 also includes a crash sensor module 42. The crash sensor module 42 includes a housing. In the embodiment of Fig. 1, crash sensors 32 and 34 are located in the crash sensor module 42 and, the crash sensor module 42 is located at a central location in the vehicle 12. Crash sensor 32, as shown schematically in Fig. 2, includes an X-accelerometer 50 and a Y-accelerometer 52 that have substantially traverse axes of sensitivity.

During operation of the system 10, the plurality of crash event sensors 32, 34, 36, 38, and 40 sense their associated conditions of the vehicle and provide the

controller 30 with signals indicative of the sensed conditions. The controller 30 includes a crash discrimination function 94 that receives signals from the plurality of crash event sensors 32, 34, 36, 38, and 40 and performs a crash severity algorithm for determining whether a crash event is occurring for which deployment of one or more of the actuatable restraint devices 18, 20, 22, 24, 26, and 28 is desired.

With reference to the actuatable restraint devices 18, 20, and 22 associated with the driver seat 14 of the vehicle 12, the crash discrimination function 94 is operatively coupled to AND gates 110, 112, and 114. Each of the AND gates 110, 112, and 114 is associated with one of the actuatable restraint devices 18, 20, and 22. The crash discrimination function 94 provides the AND gates 110, 112, and 114 with crash signals that indicate whether a crash event is occurring for which deployment of the respective actuatable restraint device 18, 20, or 22 is desired.

The AND gates 110, 112, and 114 are also operatively coupled to a safing function 118 of the controller 30. The safing function 118 uses the signal provided to the controller 30 by the acoustic sensor 34 for determining whether a crash event is occurring for which deployment of one or more of the actuatable restraint devices 18, 20, 22, 24, 26, and 28 is desired. The safing function 118 provides safing signals to the AND gates 110, 112, and 114. Each of the AND gates 110, 112, and 114 of the controller 30 is operable for actuating its associated occupant restraint device 18, 20, and 22, respectively, only in response to receiving both a crash signal and a safing signal that separately indicate the occurrence of a deployment crash event.

In the embodiment of Fig. 3, the system 210 includes a central module 214 having a controller. An acceleration sensor 216 for sensing acceleration along an X-

axis of the vehicle 212 and an omni-directional ultrasonic sensor 218 for sensing high frequency acoustic waves that propagate through the vehicle structure during the occurrence of a vehicle crash event are also located in the central module 214. The system 210 also includes side impact crash sensors 228 and 230 that are located at side locations of the vehicle 212 remote from the central module 214. The side impact crash sensors 228 and 230 are accelerometers that detect acceleration of a side part of the vehicle 212 along a Y-axis. In the embodiment of Fig. 3, the ultrasonic sensor 218 provides omni-directional safing for both frontal vehicle crash events and side impact crash events. Accordingly, the controller of the central module 214 controls actuation of the associated occupant restraint devices in response to the acoustic waves detected by the ultrasonic sensor 218 and the vehicle acceleration detected by the acceleration sensor 216 and/or the remote crush zone sensors 228 and 230.

In the embodiment of Fig. 4, the system 310 includes a central module 314 having a controller. An ultrasonic sensor 316 for sensing high frequency acoustic waves that propagate through the vehicle structure during the occurrence of a vehicle crash event is also located in the central module 314. A front crash event sensor 318, which is preferably an accelerometer and a crush zone sensor, is connected with the central module 314. An axis of sensitivity of the front crash event sensor 318 is oriented along an X-axis of the vehicle 312. The system 310 also includes side impact crash event sensors 320 and 322 that are connected with the central module 314. The side impact crash event sensors 320 and 322 are located at the respective sides of the vehicle 312 remote from the central module 314 and

are crush zone sensors having axes of sensitivity oriented along a Y-axis of the vehicle 312.

The central module 314 controls actuation of the associated occupant restraint devices (e.g., 324, 326, 328, 330) in response to the acoustic waves detected by the ultrasonic sensor 316 and vehicle acceleration detected by at least one of the remote crash sensors 318, 320 and 322. The ultrasonic sensor 316 provides omni-directional safing for each of the crash event sensors 318, 320, and 322.

6. ISSUES

a. Whether the rejection of independent claims 1, 10, 17, and 22, and dependent claims 2, 4, 8, 11-13, 18, 19, and 21 as being obvious over Thompson et al. in view of Feldmaier is proper.

b. Whether the rejection of independent claim 14 and dependent claims 3, 9, 15, and 16 as being obvious over Thompson et al. in view of Feldmaier is proper.

c. Whether the rejection of dependent claim 5 as being obvious over Thompson et al. in view of Feldmaier is proper.

d. Whether the rejection of dependent claim 6 as being obvious over Thompson et al. in view of Feldmaier and further in view of Breed et al. is proper.

e. Whether the rejection of dependent claim 20 as being obvious over Thompson et al. in view of Feldmaier and further in view of Breed et al. is proper.

f. Whether the rejection of dependent claim 7 as being obvious over Thompson et al. in view of Feldmaier is proper.

7. GROUPING OF CLAIMS

a. Independent claims 1, 10, 17, and 22, and dependent claims 2, 4, 8, 11-13, 18, 19, and 21 stand or fall together.

b. Independent claim 14 and dependent claims 3, 9, 15, and 16 stand or fall together.

c. Dependent claim 5 stands or falls alone.

d. Dependent claim 6 stands or falls alone.

e. Dependent claim 20 stands or falls alone.

f. Dependent claim 7 stands or falls alone.

Claim groups a-f stand or fall independently from one another.

8. ARGUMENT

a. The Rejection of Independent claims 1, 10, 17, and 22 and dependent claims 2, 4, 8, 11-13, 18, 19, and 21 as being obvious over Thompson et al. in view of Feldmaier

Claim 1 recites a system for helping to protect a vehicle occupant. The system comprises a crash sensor operative to sense a vehicle crash event and to provide a crash signal having a characteristic indicative of the sensed crash event. The system also comprises an acoustic safing sensor operative to sense acoustic waves propagating through the vehicle structure during a vehicle crash event and to provide a safing signal having a characteristic indicative of the sensed crash event. An actuatable occupant protection device of the system, when actuated, helps to protect the vehicle occupant during a vehicle crash event. The system further

includes a controller which controls actuation of the occupant protection device in response to both the crash signal and the safing signal separately indicating the occurrence of a deployment crash event.

Claim 1 stands rejected as being obvious over Thompson et al. in view of Feldmaier. The M.P.E.P. sets forth the criteria for a rejection for obviousness as follows:

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

See, MPEP § 706.02(j) *citing* In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). It is respectfully suggested that a combination of Thompson et al. and Feldmaier, as is proposed in the rejection of claim 1, fails to establish a prima facie of obviousness with regard to claim 1 for at least the following reasons:

1. A Combination of Thompson et al. and Feldmaier fails to teach or suggest the controller of claim 1

Claim 1 recites that the controller controls actuation of the occupant protection device in response to both the crash signal and the safing signal separately indicating the occurrence of a deployment crash event. Thompson et al. discloses accelerometers 48 and side crush tubes 50. Thompson et al. provides no details as to how an electronic control module 180 determines the occurrence of a deployment

crash event. Thompson et al. merely states that the electronic control module 180 periodically interrogates the output of at least one crash sensor accelerometer 48 or crush sensor 50 to determine if a crash event has begun. (Thompson et al., Col. 4, lines 1-4). Thompson et al. also teaches that "[b]ased upon the magnitude of the crash sensor output the [electronic control module 180] determines the severity of the crash and whether components in the safety restraint system will be initiated." (Thompson et al., Col. 4, lines 12-15). These recitations of Thompson et al. suggest that the electronic control module 180 controls actuation of the safety restraint system based upon the output of a single crash sensor accelerometer 48 or a single side crush tube 50 indicating the occurrence of a deployment crash event.

Feldmaier also fails to teach or suggest the controller of claim 1. Feldmaier discloses acoustic sensors 15 and 16 located on side rails 11 and 12, respectively, of a vehicle body 10. Feldmaier teaches a signal processing apparatus 17 for actuating a passive restraint in response to a signal from either one of the acoustic sensors 15 or 16. Since neither Thompson et al. nor Feldmaier teaches or suggests a controller that controls actuation of an occupant protection device in response to both a crash signal and a safing signal separately indicating the occurrence of a deployment crash event, a combination of the references also fails to teach or suggest this feature of claim 1.

The Examiner appears to recognize that neither Thompson et al. nor Feldmaier teaches the controller of claim 1 by stating in the Remarks portion of the Office Action of December 11, 2003 that "[a]lthough it is not stated, it is implied, and understood, that the controller employs all signals from the various sensors to

determine actuation." The Examiner further states that such an arrangement is extremely well-known in the art. It is respectfully suggest that if such an arrangement "is extremely well-known in the art," then the Examiner should cite a reference in rejecting claim 1 that teaches or suggests such an arrangement. Since the Examiner has failed to cite a reference that teaches or suggests this limitation of claim 1, a prima facie case of obviousness has not been met and the rejection of claim 1 is improper. Thus, the rejection of claim 1 should be withdrawn.

2. A Combination of Thompson et al. and Feldmaier fails to teach or suggest the acoustic safing sensor of claim 1

The term "safing sensor" is a term of art that identifies a sensor that operates separately and independently from a vehicle discrimination crash sensor to determine the occurrence of a deployment crash event. The safing sensor acts to confirm the occurrence of a deployment crash event. When a safing sensor is used in a deployment algorithm, the air bag, or other actuatable occupant protection device, will not be actuated until both the vehicle discrimination crash sensor and the safing sensor separately and independently determine that a deployment crash event has occurred.

Claim 1 recites an acoustic safing sensor that is operative to sense acoustic waves propagating through the vehicle structure during a vehicle crash event and to provide a safing signal having a characteristic indicative of the sensed crash event. Neither Thompson et al. nor Feldmaier teaches or suggests an acoustic safing sensor. The crash sensors disclosed in Thompson et al. include accelerometers 48 and crush tubes 50. No acoustic sensor is disclosed in Thompson et al. Feldmaier discloses acoustic sensors 15 and 16. Feldmaier, however, fails to teach or suggest

the use of one of the acoustic sensors 15 and 16 as a safing sensor to confirm the occurrence of a deployment crash event. In Feldmaier, either acoustic sensor 15 or 16 may individually cause actuation of the passive restraint. Therefore, the acoustic sensors 15 and 16 of Feldmaier are discrimination sensors and are not safing sensors. Since neither Thompson et al. nor Feldmaier teaches or suggests an acoustic safing sensor, a combination of the references also fails to teach or suggest this limitation of claim 1. Thus, for this further reason, the rejection of claim 1 is improper and should be withdrawn.

3. There is no suggestion or motivation to combine Thompson et al. and Feldmaier

It is also respectfully suggested that there is no suggestion or motivation to combine the teachings of Thompson et al. and Feldmaier. Thompson et al. is directed to a system for sensing the position of the occupant in a vehicle while Feldmaier is directed to sensing acoustics during vehicle deformation. The Office Action states as motivation for the combination that the acoustic sensor of Feldmaier will "increase the accuracy and efficiency of the occupant protection system" of Thompson et al. Neither Thompson et al. nor Feldmaier teaches or suggests that the accuracy and efficiency of an occupant protection system will be increased by using the acoustic sensors. Therefore, neither Thompson et al. nor Feldmaier provides the motivation relied upon by the Examiner in combining Thompson et al. and Feldmaier.

In the response of October 2, 2003, an affidavit of the Examiner pursuant to 37 C.F.R. §1.104(d)(2) was requested to establish any personal knowledge that the Examiner may possess regarding the use of acoustic sensors for increasing the

accuracy and efficiency of an occupant protection system, such as the system disclosed in Thompson et al. In the Office Action of December 11, 2003, the Examiner rejected the request for an affidavit and stated that "[a]pplicant's supposition that Examiner has 'personal knowledge' to offer a motivation (his implication that it is patently nonexistent) is interesting in light of the vast multitude of references which disclose a combination, or combinations, of different sensors." The Examiner further states that "[i]t is clear that a large number of different sensors are in fact unnecessary for actuation, but is preferred to increase the accuracy of the system, and to provide redundancy." The Examiner then concludes that "motivation does exist to combine the reference, and in fact, this motivation is very well-known."

Combining a large number of different sensors does not provide motivation to combine the teachings of Thompson et al. and Feldmaier. Thompson et al. already discloses two accelerometer crash sensors 48 and two crush tubes 50. Therefore, Thompson et al. already includes a large number of different sensors. For the cited motivation for combining Thompson et al. and Feldmaier to be proper, there must be a teaching or suggestion that the use of acoustic sensors will increase the accuracy and efficiency of an occupant protection system. The Examiner cites no reference for such a teaching. If this motivation is "very well-known," then the Examiner should cite a reference with this teaching or, alternatively, submit an affidavit setting forth her personal knowledge, as has been requested.

Moreover, it appears that the suggested combination of Thompson et al. and Feldmaier only seems plausible using hindsight after having the benefit of the Applicants' disclosure. The use of the teachings of the present invention to find

obviousness is impermissible. "It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." In Re Fritch, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992). Thus, it is respectfully suggested that there is no suggestion or motivation for combining Thompson et al. and Feldmaier. Therefore, for this still further reason, the rejection of claim 1 is improper and should be withdrawn.

Independent claims 10, 17, and 22 have limitations that are similar to claim 1 and are allowable over a combination of Thompson et al. and Feldmaier for at least the same reasons as claim 1.

Dependent claims 2, 4, and 8 depend from claim 1 and are allowable for at least the same reasons as claim 1. Dependent claims 11-13 depend from claim 10 and are allowable for at least the same reasons as claim 10. Dependent claims 18, 19, and 21 depend from claim 17 and are allowable for at least the same reasons as claim 17.

b. The Rejection of Independent claim 14 and dependent claims 3, 9, 15, and 16 as being obvious over Thompson et al. in view of Feldmaier

In addition to the reasons set forth above with specific reference to claim 1, independent claim 14 and dependent claims 3, 9, 15, and 16 each recites a sensor module that includes the acoustic sensor and at least one other accelerometer. It is respectfully suggested that neither Thompson et al. nor Feldmaier teaches or suggests a sensor module that includes an acoustic sensor and an accelerometer.

In specifically rejecting claim 9, the Office Action states that "the references do not specify that the acoustic sensor and accelerometer form a portion of a

module, but it would have been obvious to one with ordinary skill in the art at the time the invention was made to include this particular arrangement to decrease design and manufacturing costs and provide easy access to either or both sensors." Such a rejection is improper for at least the following reasons.

Neither Thompson et al. nor Feldmaier includes both an accelerometer and an acoustic sensor. Thompson et al. discloses accelerometers 48 and Feldmaier discloses acoustic sensors 15 and 16. Neither reference, however, discloses both an accelerometer and an acoustic sensor.

Combining an accelerometer and an acoustic sensor, each of which senses the occurrence of a crash event, into a single module requires more than merely a design choice. Thompson et al. includes two accelerometers 48 and two crush tubes 50. Each of the sensors 48 and 50 is located at a particular vehicle location for sensing the occurrence of a crash event into the particular vehicle location. Likewise, Feldmaier teaches two acoustic sensors 15 and 16, each of which is located on an associated side rail of the vehicle body. Neither Thompson et al. nor Feldmaier teaches two sensor located adjacent one another. Therefore, one of ordinary skill in the art would not be motivated to combine multiple sensors of the system into a single sensor module as such a combination would require movement of sensor locations away from their particular vehicle locations and thus, modification of the system for compensating for the changed location of the sensors. Therefore, it is respectfully suggested that the rejection of independent claim 14 and dependent claims 3, 9, 15, and 16 is improper and should be withdrawn.

c. The Rejection of dependent claim 5 as being obvious over Thompson et al. in view of Feldmaier

In addition to the reasons set forth above with specific reference to claim 1, claim 5 also recites that the accelerometer is a crush zone sensor. A "crush zone sensor" is a sensor that is located in a crush zone of a vehicle. Thompson et al. discloses accelerometers 48 but fails to teach or suggest whether accelerometers 48 are located in a crush zone of the vehicle. Feldmaier fails to teach or suggest accelerometers. Since neither Thompson et al. nor Feldmaier teaches or suggests an accelerometer that is a crush zone sensor, a combination of the references also fails to teach or suggest this feature of claim 5. Therefore, the rejection of claim 5 is improper and should be withdrawn.

d. The Rejection of dependent claim 6 as being obvious over Thompson et al. in view of Feldmaier and further in view of Breed et al.

In addition to the reasons set forth above with specific reference to claims 1 and 5, claim 6 also recites that the crush zone sensor is a front crush zone sensor located at a forward part of the vehicle. None of Thompson et al., Feldmaier, or Breed et al. teaches or suggests an accelerometer that is a front crush zone sensor located at a forward part of the vehicle. The Office Action relies upon Breed et al. for the teaching of a front crush zone sensor. The crush detecting device of Breed et al., however, is not an accelerometer, as is set forth in claim 5 from which claim 6 depends. Since none of Thompson et al., Feldmaier, or Breed et al. teaches or suggests an accelerometer that is a front crush zone sensor located at a forward part of the vehicle, a combination of the references also fails to teach or suggest this

feature of claim 6. Therefore, the rejection of claim 6 is improper and should be withdrawn.

Additionally, there is no suggestion or motivation to combine the crush detecting device of Breed et al. with a combination of Thompson et al. and Feldmaier et al. Again, as cited motivation, the Examiner states that the combination will "increase the accuracy of the protection system." None of the references teaches or suggests that adding the crush detecting device of Breed et al. with a combination of Thompson et al. and Feldmaier will "increase the accuracy of the protection system." Thus, for this further reason, the rejection of claim 6 is improper and should be withdrawn.

e. The Rejection of dependent claim 20 as being obvious over Thompson et al. in view of Feldmaier and further in view of Breed et al.

In addition to the reasons set forth above with specific reference to claim 1, claim 20 further recites a front crush zone sensor at a forward part of the vehicle. The Office Action relies upon the teachings of Breed et al. for the front crush zone sensor at a forward part of the vehicle. For the reasons set forth above with regard to claim 6, there is no suggestion or motivation to combine the crush detecting device of Breed et al. with a combination of Thompson et al. and Feldmaier et al. Thus, the rejection of claim 20 is improper and should be withdrawn.

f. The Rejection of dependent claim 7 as being obvious over Thompson et al. in view of Feldmaier

In addition to the reasons set forth above with specific reference to claims 1 and 5, claim 7 also recites that the crush zone sensor is a side crush zone sensor located at a side part of the vehicle. Thompson et al. and Feldmaier fail to teach or

suggest an accelerometer that is a side crush zone sensor located at a side part of the vehicle. The Office Action relies upon the side crush tubes 50 of Thompson et al. for rejecting claim 7. The side crush tubes 50 of Thompson et al., however, are not accelerometers, as set forth in claim 5 from which claim 7 depends. Since neither Thompson et al. nor Feldmaier teaches or suggests this feature of claim 7, a combination of the references also fails to teach or suggest this feature of claim 7. Therefore, the rejection of claim 7 is improper and should be withdrawn.

g. Conclusion

In view of the foregoing, Appellant respectfully submits that claims 1-22 are allowable. Reversal of the rejection is respectfully requested.

9. APPENDIX

Appendix A attached contains a copy of the claims on appeal.

Please charge any deficiency or credit any overpayment in the fees for this Appeal Brief to Deposit Account No. 20-0090.

Respectfully submitted,

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APPENDIX A

1. A system for helping to protect a vehicle occupant, said system comprising:

a crash sensor operative to sense a vehicle crash event and provide a crash signal having a characteristic indicative of the sensed crash event;

an acoustic safing sensor operative to sense acoustic waves propagating through the vehicle structure during a vehicle crash event and provide a safing signal having a characteristic indicative of the sensed crash event;

an actuatable occupant protection device for, when actuated, helping to protect the vehicle occupant during a vehicle crash event; and

a controller which controls actuation of said occupant protection device in response to both said crash signal and said safing signal separately indicating the occurrence of a deployment crash event.

2. A system as set forth in claim 1 wherein said crash sensor is an accelerometer.

3. A system as set forth in claim 2 further including a sensor module mountable within a vehicle, said sensor module including said acoustic sensor and said accelerometer.

4. A system as set forth in claim 2 wherein said acoustic sensor is an omni-directional ultrasonic sensor for sensing ultrasonic acoustic waves propagating through the vehicle structure during vehicle crash events originating in any of a plurality of directions and providing said safing signal indicative thereof.

5. A system as set forth in claim 4 further including a sensor module mountable within a vehicle, said ultrasonic sensor being part of said sensor module, said accelerometer being a crush zone sensor remote from said sensor module for sensing acceleration of part of the vehicle indicative of a vehicle crash event and providing said crash signal having an electrical characteristic indicative thereof.

6. A system as set forth in claim 5 wherein said crush zone sensor is a front crush zone sensor located at a forward part of the vehicle and electrically connected with said controller, said front crush zone sensor sensing a front impact vehicle crash event in response to movement of the forward part of the vehicle and providing a front crash signal indicative thereof, said controller controlling actuation of said occupant protection device in response to both said safing signal and said front crash signal indicating the occurrence of a crash event.

7. A system as set forth in claim 5 wherein said crush zone sensor is a side crush zone sensor located at a side part of the vehicle and electrically connected with said controller, said side crush zone sensor sensing a side impact vehicle crash event in response to movement of the side part of the vehicle and

providing a side crash signal indicative thereof, said controller controlling actuation of said occupant protection device in response to both said safing signal and said side crash signal indicating the occurrence of a crash event.

8. A system as set forth in claim 1 wherein said crash sensor further includes a plurality of accelerometers, each of said plurality of accelerometers being operative to sense vehicle acceleration and provide a respective acceleration signal, said controller controlling actuation of said occupant protection device in response to an acceleration signal from at least one of said plurality of accelerometers and said safing signal.

9. A system as set forth in claim 8 further including a sensor module mountable within a vehicle, said acoustic sensor and at least one of said plurality of accelerometers being part of said sensor module.

10. A system for helping to protect a vehicle occupant, said system comprising:

a plurality of crash event sensors, each of said plurality of crash event sensors being operative to sense a different condition of the vehicle and to provide a corresponding sensor signal having a characteristic indicative of the vehicle condition sensed thereby;

an acoustic safing sensor operative to sense acoustic waves propagating through the vehicle structure during a vehicle crash event and to provide a safing signal having a characteristic indicative of the sensed crash event;

an occupant protection device for, when actuated, helping to protect the vehicle occupant during a vehicle crash event; and

a controller connected with each of said plurality of crash event sensors, said acoustic safing sensor, and said occupant protection device, said controller determining the occurrence of a vehicle crash event and controlling actuation of said occupant protection device in response to the sensor signal from any one of said plurality of crash event sensors and the safing signal from said acoustic safing sensor separately indicating the occurrence of a deployment crash event.

11. A system as set forth in claim 10 wherein each of plurality of said crash event sensors is selected from a group consisting of an accelerometer and a crush zone sensor.

12. A system as set forth in claim 10 further including a sensor module mountable within a vehicle, said acoustic sensor being part of said sensor module.

13. A system as set forth in claim 12 wherein said at least one of said plurality of crash event sensors is part of said sensor module.

14. A system for helping to protect a vehicle occupant, said system comprising:

a sensor module for mounting in a vehicle, said sensor module including:

an accelerometer operative to sense vehicle acceleration and provide an acceleration signal having a characteristic indicative of the sensed vehicle acceleration; and

an acoustic sensor operative to detect acoustic waves propagating through the vehicle structure during a vehicle crash event and to provide a safing signal having a characteristic indicative of the sensed crash event;

an occupant protection device for, when actuated, helping to protect the vehicle occupant during a vehicle crash event; and

a controller which controls actuation of said occupant protection device in response to both said acceleration signal and said safing signal separately indicating the occurrence of a deployment crash event.

15. A system as set forth in claim 14 wherein said sensor module further includes a plurality of accelerometers, each of said plurality of accelerometers being operative to sense vehicle acceleration and provide a respective acceleration signal indicative of the vehicle acceleration sensed thereby, said controller controlling actuation of said occupant protection device in response to the acceleration signal from at least one of said plurality of accelerometers and said safing signal from said

acoustic sensor, whereby the acoustic sensor provides a safing signal for each of the plurality of accelerometers.

16. A system as set forth in claim 14 further including a side crush zone sensor located at a side part of the vehicle and electrically connected with said controller, said side crush zone sensor sensing a side impact vehicle crash event in response to acceleration of the side part of the vehicle and providing a side crash signal indicative thereof, said controller controlling actuation of said occupant protection device in response to both said safing signal and said side crash signal indicating the occurrence of a crash event.

17. A method for controlling actuation of an actuatable occupant protection device of a vehicle, said method comprising the steps of:

sensing a vehicle crash condition;

providing a crash event signal having a characteristic indicative of the sensed vehicle crash condition;

sensing acoustic waves that travel through the vehicle structure during the occurrence of the vehicle crash condition;

providing a safing signal in response to the sensed acoustic waves during the vehicle crash condition;

determining the occurrence of a vehicle crash event in response to both the crash event signal and the safing signal separately indicating the occurrence of a vehicle crash condition; and

controlling actuation of an occupant protection device in response to said determination.

18. A method as set forth in claim 17 further including providing a plurality of crash event sensors, each of the crash event sensors sensing a vehicle crash condition and providing a crash event signal indicative of the vehicle crash condition sensed thereby, said step of determining a vehicle crash event further including determining the occurrence of a vehicle crash event in response to the crash signal from at least one of the plurality of crash event sensors and the safing signal from the acoustic sensor.

19. A method as set forth in claim 18 wherein each crash sensor is an accelerometer that provides an acceleration signal indicative of vehicle acceleration.

20. A method as set forth in claim 17 further including mounting a front crush zone sensor at a forward part of the vehicle, said step of sensing a vehicle crash condition including sensing a front impact vehicle crash event with the front crush zone sensor, the crash event signal being a front crash signal indicative of the sensed front impact vehicle crash event sensed by the front crush zone sensor, actuation of the occupant protection device being controlled in response to both the safing signal and the front crash signal indicating the occurrence of a crash event.

21. A method as set forth in claim 17 further including mounting a side crush zone sensor at a side part of the vehicle, said step of sensing a vehicle crash condition including sensing a side impact vehicle crash event with the side crush zone sensor, the crash event signal being a side crash signal indicative of the sensed side impact vehicle crash event sensed by the side crush zone sensor, actuation of the occupant protection device being controlled in response to both the safing signal and said the crash signal indicating the occurrence of a crash event.

22. A system for helping to protect a vehicle occupant, said system comprising:

means for sensing a vehicle crash condition and providing a crash event signal having a characteristic indicative thereof;

means for sensing acoustic waves that travel through the vehicle structure in response to the occurrence of the vehicle crash condition and providing a safing signal having a characteristic indicative of a vehicle crash event; and

control means for determining the occurrence of a vehicle crash event in response to both the crash event signal and the safing signal separately indicating the occurrence of a deployment crash event and controlling actuation of an occupant protection device in response to the determination.